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10/023,137	12/17/2001	Nathan D. Cahill	83512THC	4712

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EXAMINER

YODER III, CHRISS S

ART UNIT	PAPER NUMBER
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2622

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09/12/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/023,137	Applicant(s) CAHILL ET AL.	
	Examiner Chriss S. Yoder, III	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-13, 15 and 17-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18 and 21 is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-13, 15, 17, 19, 20 and 22-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 18, 2007 has been entered.

Response to Arguments

Applicant's arguments filed May 17, 2007 have been fully considered but they are not persuasive.

Applicant argues, with respect to claim 1, that "Szeliski et al. is not understood to teach or suggest determining focal length at least by optimizing an error measure that is a function of the one or more sets of corresponding pixel values". Applicant states that because "the Szeliski et al. Patent is understood to determine focal length by first computing perspective transforms relating two or more images, where the focal lengths of each image are estimated from the parameters of the perspective transforms using the equations in column 15, lines 25-46 (the Examiner believes that Applicant unintentionally cited column 15, but intended to cite column 16). And that "as stated in column 15, lines 47-54, the focal length is determined by computing the geometric mean (or median, in the case of more than two images) of the focal lengths estimated

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for each image" (again, the Examiner believes that Applicant unintentionally cited column 15, but intended to cite column 16).

However, the Examiner disagrees, noting that the portion of Szeliski that has been relied upon teaches an initial estimation of the focal lengths (column 15, line 65 - column 16, line 62), and that these initial estimates are used in the optimization of an error measure that is a function of the one or more sets of corresponding pixel values as can be seen in column 20, line 41 - column 25, line 34 (specifically in column 20, line 41 - column 21, line 29, a brief description is provided of the further processing to determine the focal length using an optimization of the estimated values; and additionally in column 21, line 30 - column 25, line 35, a more detailed description of the process of optimizing an error measure that is a function of the corresponding pixel values).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-3, 6, 7, 13, 15, 17, 19-20, and 22-24 are rejected under 35 U.S.C.

103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440).

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2. In regard to **claim 1**, note Szeliski discloses the use of a method for producing a composite digital image, comprising the steps of providing a plurality of partially overlapping source digital images having pixel values that are linearly or logarithmically related to scene intensity, wherein the source images have overlap regions wherein pixels of the images correspond in scene content and differing in scene content outside said overlap regions (figure 1: I_0-I_k), determining the focal length of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions, wherein said determining step comprises optimizing an error measure that is a function of the one or more sets of corresponding pixel values (column 15, line 65 - column 16, line 62 and column 20, line 41 – column 25, line 34, and figure 1:110; an initial estimate of the focal length is calculated, then these values are optimized using an error measure that is a function of the images), and combining adjusted source digital images to form a composite digital image by blending said overlap regions (column 30, lines 20-30; the two images are blended to create a mosaic image after other processing/adjustments have been performed).

Therefore, it can be seen that the Szeliski device fails to disclose that the adjustments that are performed on the images include computing from the determined focal length, a radial exposure transform to compensate for exposure fall off as a function of the distance of a pixel from the center of the digital image and modifying the source digital images by applying a radial exposure transform to one or more of the source digital images to produce adjusted source digital images.

Toyoda discloses the use of the focal length to determine the radial transform for the correction of exposure falloff (column 1, lines 49-52, the marginal attenuation is considered exposure falloff; column 10, line 17-column 11, line 55; the focal length is used to compensate for marginal attenuation in the image). Toyoda teaches that the use of the focal length to determine the radial transform for the correction of exposure falloff is preferred in order to eliminate the need for a lens system having a complicated arrangement that is typically needed to correct for exposure falloff (column 1, lines 62-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to use focal length determined by Szeliski to determine the radial transform for correction of exposure falloff, as suggested by Toyoda, in order to edit the image without the use of heavy / large lens systems.

3. In regard to **claim 2**, note Szeliski discloses the a step of applying a linear exposure transform to one or more of the source digital images prior to combining the adjusted source digital images to produce adjusted source digital images having pixel values that closely match in an overlapping region (column 30, lines 20-30; the two images are blended to create a mosaic image).

4. In regard to **claim 3**, note Toyoda discloses that the radial exposure transform includes a \cos^4 dependence on the distance from the center of the image (column 1, lines 46-52; the vignetting is influenced by the \cos^4 law of illumination).

5. In regard to **claim 6**, note Szeliski discloses that the combining step includes calculating an average of the pixel values in the overlapping region (column 30, lines 20-30).

6. In regard to **claim 7**, note Szeliski discloses transforming the pixel values of the composite digital image to output device compatible color space (column 9, lines 31-35).

7. In regard to **claim 13**, note Toyoda discloses the storage of the transform information (column 9, lines 45-48). Therefore, it can be seen that the primary reference of Szeliski in view of Toyoda fails to disclose the use of metadata stored with the image to store the radial transform. Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the radial transform in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional image parameters and camera settings as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

8. In regard to **claim 15**, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 1. Therefore, it can be seen that the primary reference fails to disclose that the radial exposure transform is calculated using a flash indicator. Official notice is taken that the concepts and advantages of using a flash indicator to calculate the radial

exposure transform are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a flash indicator to calculate the radial transform in order to compensate for flash falloff.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of a flash indicator to calculate the radial transform in order to compensate for flash falloff, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

9. In regard to **claim 17**, note Szeliski discloses the use of a computer program product comprising computer readable storage medium having a computer program stored thereon for performing the method of claim 1 (column 7, lines 46-51).

10. In regard to **claim 19-20**, these are apparatus claims, corresponding to the method of claims 1-2. Therefore, claims 19-20 have been analyzed and rejected as previously discussed with respect claims 1-2.

11. In regard to **claim 22**, note Toyoda discloses that the determining step further comprises analyzing the exposure falloff in at least one of said overlap regions (column 10, line 17-column 11, line 55; the focal length is used to analyze the image for marginal attenuation in order to compensate the image and reduce the effects of falloff).

12. In regard to **claim 23**, note Szeliski discloses the use of a method for producing a composite digital image, comprising the steps of providing a plurality of partially overlapping source digital images, each said source digital image having an array of pixels, said pixels having values that are linearly or logarithmically related to scene

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intensity, said source digital images having overlap regions wherein pixels of said source digital images correspond in scene content, said source digital images differing in scene content outside said overlap regions (figure 1: I_0-I_k), determining the focal length of the source digital images from one or more sets of corresponding pixel values of the source digital images in said overlap regions, wherein said determining step comprises optimizing an error measure that is a function of the one or more sets of corresponding pixel values (column 15, line 65 - column 16, line 62 and column 20, line 41 – column 25, line 34, and figure 1:110; an initial estimate of the focal length is calculated, then these values are optimized using an error measure that is a function of the images), a step of applying a linear exposure transform to one or more of the source digital images prior to combining the adjusted source digital images to produce adjusted source digital images having pixel values that closely match in an overlapping region (column 30, lines 20-30; the two images are blended to create a mosaic image), and combining adjusted source digital images to form a composite digital image by blending said overlap regions (column 30, lines 20-30; the two images are blended to create a mosaic image after other processing/adjustments have been performed).

Therefore, it can be seen that the Szeliski device fails to disclose that the adjustments that are performed on the images include computing from the determined focal length, a radial exposure transform to compensate for exposure fall off as a function of the distance of a pixel from the center of the digital image and modifying the source digital images by applying a radial exposure transform to one or more of the source digital images to produce adjusted source digital images.

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Toyoda discloses the use of the focal length to determine the radial transform for the correction of exposure falloff (column 1, lines 49-52, the marginal attenuation is considered exposure falloff; column 10, line 17-column 11, line 55; the focal length is used to compensate for marginal attenuation in the image). Toyoda teaches that the use of the focal length to determine the radial transform for the correction of exposure falloff is preferred in order to eliminate the need for a lens system having a complicated arrangement that is typically needed to correct for exposure falloff (column 1, lines 62-67). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to use focal length determined by Szeliski to determine the radial transform for correction of exposure falloff, as suggested by Toyoda, in order to edit the image without the use of heavy / large lens systems.

13. In regard to **claim 24**, this is an apparatus claim, corresponding to the method of claims 23. Therefore, claim 24 has been analyzed and rejected as previously discussed with respect claim 23.

14. Claims 4 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and "Reference Input/Output Medium Metric RGB Color Encodings".

15. In regard to **claim 4**, note Szeliski discloses that the step of providing source digital images comprises capturing images and storing them in a digital memory (column 9, lines 13-18). Therefore, it can be seen that the primary reference of Szeliski

in view of Toyoda fails to disclose that the transform is a metric transform that is scene independent.

"Reference Input/Output Medium Metric RGB Color Encodings" discloses the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent (found in the abstract, RIMM/ROMM is an metric encoding technique used to transform the source images; and in the first two paragraphs of the Introduction it can be seen that the image can be device dependent instead of scene dependent). "Reference Input/Output Medium Metric RGB Color Encodings" teaches that the use of a metric transform applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent is preferred in order to increase the dynamic range of the stored image in order to match a device (page 7: ERIMM RGB Color Encoding). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a metric transform that is applied to a source digital image such that the pixel values of the transformed source digital image are linearly or logarithmically related to scene intensity that is scene independent in order to increase the dynamic range of the stored image as suggested by "Reference Input/Output Medium Metric RGB Color Encodings".

16. In regard to **claim 8**, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a color transformation matrix

(page 4: ROMM RGB Conversion Matrix- the transform uses a color transformation matrix).

17. In regard to **claim 9**, note "Reference Input/Output Medium Metric RGB Color Encodings" discloses that the metric transform includes a lookup table (page 2: Selection of Color Space- paragraph 2, "simple LUT-matrix-LUT transformation can be used").

18. In regard to **claim 10**, note Szeliski in view of Toyoda and "Reference Input/Output Medium Metric RGB Color Encodings" discloses the use of a method for producing a composite digital image as claimed in claim 4. Therefore, it can be seen that the primary reference fails to disclose that the metric transform is included as metadata with the corresponding source digital image. Official notice is taken that the concepts and advantages of storing information pertaining to the image as metadata is notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the storage of the metric transform as metadata in order to store the associated data together for better organization as well as to keep related data together in instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional information pertaining to the image as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

19. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and Inoue et al. (US Patent # 5,083,209).

20. In regard to **claim 11**, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 23. Therefore, it can be seen that the primary reference fails to disclose that the linear exposure transform is a function of the shutter speed used to capture the source digital image, and that the shutter speed is included as meta-data with the corresponding source digital image.

Inoue discloses the use of an exposure transform that is a function of the shutter speed used to capture the image (column 2, lines 9-12; and column 3, lines 7-16; the brightness is adjusted based on a function of shutter speed; the shutter speed is changed to obtain the desired brightness). Inoue teaches that the use of a transform that is a function of shutter speed is preferred in order to obtain the desired brightness values of the image (column 2, lines 9-12). Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of a transform that is a function of shutter speed as suggested by Inoue.

Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the shutter speed in order to store the associated data together for better organization as well as to

keep related information together for instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional information pertaining to the image as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

21. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Szeliski et al. (US Patent # 6,097,854) in view of Toyoda et al. (US Patent # 5,461,440) and Hirai et al. (US Patent #6,603,928).

22. In regard to **claim 12**, note the primary reference of Szeliski in view of Toyoda discloses the use of a method for producing a composite digital image as claimed in claim 23. Therefore, it can be seen that the primary reference fails to disclose that the linear exposure transform is a function of the f-number used to capture the source digital image and that the f-number is included as meta-data with the corresponding source digital image.

Hirai discloses the use of an exposure transform that is a function of the f-number used to capture the image (column 2, lines 10-25; and column 3, lines 16-17; the f-number is used to compensate the image). Hirai teaches that the use of a transform that is a function of the f-number is preferred in order to correct image coloring to a desire value (column 2, lines 10-30). Therefore, it would have been

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obvious to one of ordinary skill in the art to modify the primary device to include the use of a transform that is a function of the f-number as suggested by Hirai.

Official notice is taken that the concepts and advantages of storing additional image parameters and camera settings as metadata are notoriously well known and expected in the art. Therefore, it would have been obvious to one of ordinary skill in the art to modify the primary device to include the use of metadata to store the shutter speed in order to store the associated data together for better organization as well as to keep related information together for instances such as data transfer from one device to another.

Since applicant did not traverse the Official notice, the statement of common knowledge or well-known use of storing additional information pertaining to the image as metadata, it is therefore, taken to be admitted prior based on the requirement of MPEP § 2144.03(c).

Allowable Subject Matter

Claims 18 and 21 are allowed.

23. As for claims 18, the prior art does not teach or fairly suggest the use of a method for producing a composite digital image using the root of the function:

$$g(f) = l_i'' \cos^4 \left(\tan^{-1} \left(f^{-1} \sqrt{u_i^2 + v_i^2} \right) \right) - l_i' \cos^4 \left(\tan^{-1} \left(f^{-1} \sqrt{x_i^2 + y_i^2} \right) \right)$$

to calculate the focal length of the overlapping regions.

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24. As for claims 21, the prior art does not teach or fairly suggest the use of a system for producing a composite digital image using the root of the function:

$$g(f) = I_i'' \cos^4 \left(\tan^{-1} \left(f^{-1} \sqrt{u_i^2 + v_i^2} \right) \right) - I_i' \cos^4 \left(\tan^{-1} \left(f^{-1} \sqrt{x_i^2 + y_i^2} \right) \right)$$

to calculate the focal length of the overlapping regions.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chriss S. Yoder, III whose telephone number is (571) 272-7323. The examiner can normally be reached on M-F: 8 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lin Ye can be reached on (571) 272-7372. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CSY
August 23, 2007



LIN YE
SUPERVISORY PATENT EXAMINER